

POSTER SESSION

1030 Intravascular Guidance of Percutaneous Coronary Interventions

Sunday, March 17, 2002, Noon-2:00 p.m.
Georgia World Congress Center, Hall G
Presentation Hour: Noon-1:00 p.m.

1030-1

Relationship of Severe Microvascular Injury as Assessed Based on Phasic Coronary Flow Patterns With Complications and In-Hospital Survival After Acute Myocardial Infarction

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Background: Previous studies have shown that angiographic contrast velocity, as defined by the Thrombolysis in Myocardial Infarction (TIMI) criteria, can differentiate different levels of antegrade flow, with different prognostic implications. Our recent study has identified, using a Doppler guidewire, phasic coronary flow patterns (CFP) that differentiate patients with residual flow-limiting obstructions from those with severe microvascular injury, both of which lead to persistent slow reflow (TIMI 2 flow). However, the relation between severe microvascular injury and clinical outcomes has not yet been investigated. The aim of this study was to examine whether CFP may predict complications and in-hospital survival after acute myocardial infarction (AMI).

Methods: The study population consisted of 150 consecutive patients with a first anterior AMI successfully treated with percutaneous coronary intervention (PCI). We examined the CFP immediately after PCI using a Doppler guidewire. In accordance with previous reports on CFP, we defined severe microvascular injury as the diastolic deceleration time (DDT) \leq 600 ms and the presence of systolic flow reversal. From CFP, patients were divided into two groups: those without severe microvascular injury (n=101; Group 1) and those with severe microvascular injury (n=49; Group 2).

Results: Pericardial effusion and cardiac rupture were observed more frequently in Group 2 than in Group 1 (55% vs 9%, $p<0.01$; 18% vs 0%, $p<0.01$, respectively). All patients with cardiac rupture were observed in Group 2, two patients of blowout-type, one patient of ventricular septal defect, one patient of subepicardial aneurysm, and five patients of oozing rupture. Congestive heart failure (CHF) was observed more frequently in Group 2 than in Group 1 (51% vs 18%, $p<0.01$). In-hospital cardiac mortality rate was significantly higher in Group 2 than in Group 1 (16% vs 0%, $p<0.01$). Eight patients in Group 2 died, five patients due to CHF and three patients because of acute cardiac rupture.

Conclusions: These data suggest that the assessment of CFP with severe microvascular injury provides an accurate means to predict complications and in-hospital survival after AMI.

1030-2

Limitation of Intravascular Ultrasound in Determining Artery Size: Role of Distension Pressure

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Background: Intravascular ultrasound (IVUS) allows in vivo investigation of coronary arterial remodeling. Clinically available IVUS catheters are approximately 1 mm in diameter and may impede flow in an arterial segment beyond a significant stenosis. The effects of flow impediment and subsequent decrease in distension pressure on distal vessel size are not well characterized. We sought to determine whether vessel and lumen size distal to a significant lesion are any different after the lesion is treated with percutaneous intervention. **Methods:** We analyzed 57 patients who had IVUS examination performed before and after percutaneous intervention using a motorized pullback. Measurements were performed at each 1 mm distance from most distal to proximal end. We compared the vessel volume and plaque volume at sites distal and proximal to the treated segment, before and after percutaneous intervention. **Results:** Measurements of vessel area and plaque volume were made proximal and distal to significant stenosis (85 \pm 8% area stenosis). There was significant increase in the lumen and vessel area of the distal segments. There was no change in the plaque area. Unchanged proximal vessel, lumen and plaque area measurements indicate unaltered vasomotor tone pre and post intervention. (Table)

Segment	Preintervention	Postintervention	p
Distal Lumen area	6.78 \pm 2.31	7.76 \pm 2.41	<0.0001
Distal Vessel Area	10.85 \pm 4.22	11.90 \pm 3.99	<0.0001
Distal Plaque Area	4.19 \pm 2.70	4.18 \pm 2.98	0.94
Proximal Lumen Area	9.44 \pm 3.40	9.68 \pm 3.40	0.23
Proximal Vessel Area	16.37 \pm 4.55	16.86 \pm 5.03	0.10
Proximal Plaque Area	6.87 \pm 2.38	7.14 \pm 2.68	0.12

Conclusions: Intravascular ultrasound underestimates vessel and lumen area distal to significant luminal stenosis. This important variable should be taken into account when interpreting data on arterial remodeling.

1030-3

Intracoronary Ultrasound of Angiographically Ambiguous Left Main Coronary Artery Stenoses: Safety and Effect on Further Clinical Decision Making

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Background: In clinical practice indications for intracoronary ultrasound (ICUS) have declined in the recent years. ICUS for angiographic uncertain results of the left main coronary artery (LMCA) is one of the more common indications. There is few data about the safety and effect of ICUS on further clinical decision in those cases.

Methods: From September 1996-July 2001 55 (25%) ICUS of the LMCA out of a total of 221 ICUS were consecutively registered.

Results: Patients characterization: mean age 61 years, male sex 37 (67%), 40 (73%) stable and 15 (27%) unstable angina pectoris, known CAD 20 (36%), history of CABG 10 (18%), history of PTCA 19 (35%). ICUS of the LMCA was performed due to 39 (71%) angiographically ambiguous ostial lesions (group 1) and 16 (29%) presumed distal lesions (group 2). ICUS was feasible in 100%. There were no major ICUS-related complications: 4 (7%) patients had asymptomatic, 1 (2%) had temporary symptomatic coronary spasms.

LMCA-stenosis graded by ICUS:	Group 1 (n=39/55)	Group 2 (n=16/55)
Mild (<40%)	8 (21%)	13 (81%)
Moderate (40-70%)	19 (49%)	3 (19%)
Severe (>70%)	12 (30%)	0

Only due to ICUS findings 12 (22%) CABG were performed because of severe LMCA-stenoses, 17 (31%) presumed high-graded LMCA-stenoses could be excluded, so that an intervention was unnecessary, ICUS confirmed 26 (47%) angiographic results and did not change the further clinical decision.

Conclusion: ICUS of the LMCA in cases with ambiguous angiographic results is feasible and save, if performed by a skilled examiner. With 25% of all performed ICUS it has become an important indication. In more than 50% of those cases ICUS-diagnosis made the further clinical decision.

1030-4

Discrepancy Between Morphologic and Functional Criteria of Optimal Stent Deployment Using Intravascular Ultrasound and Pressure Derived Myocardial Fractional Flow Reserve

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Background: Pressure derived myocardial fractional flow reserve (FFR), a functional index of epicardial stenosis might be useful for assessment of optimal stent deployment. The purpose of the study was to evaluate the diagnostic potential of serial FFR measurements in comparison to the "gold standard" intravascular ultrasound (IVUS) for optimal stent expansion using "Music criteria". **Methods:** 30 patients (pts.; 9f, 21m, mean age: 62 \pm 10 yrs.) with a single de novo lesion underwent PTCA followed by stent implantation (ACS Multi-Link Rx Duet) with an initial inflation pressure of 12 atm. If optimal stent expansion criteria were not fulfilled, stent redilatation at 16 atm. was performed as well as additional balloon inflations with larger balloon sizes if necessary. IVUS and FFR were performed after each dilatation (n=114). **Results:** Mean lumen area (2.9 \pm 1.3mm²) increased after PTCA and stent implantation (12atm.) to 7.8 \pm 2.1mm² minimal stent area (MSA). Although adequate angiographic results (diameter stenosis < 10%) were obtained in 27 of 30 pts., "Music criteria" were reached only in 9 pts.. FFR normalized from 0.60 to 0.93 (19 pts. > 0.94). Redilatation (16 atm.) increased MSA to 8.0 \pm 2.3mm², which fulfilled optimal stent expansion in 27 pts. Mean MSA increased further to 10.2 \pm 3.0mm² using larger balloon sizes to fulfill IVUS inclusion criteria in all patients. Mean FFR increased slightly after stent implantation (16 atm and final: 0.96). **Conclusions:** FFR normalizes already after adequate angiographic stent implantation in approximately two thirds of pts. without reaching "Music criteria" in more than 50%. Therefore FFR does not predict optimal stent expansion according to IVUS criteria (positive predictive value 26%).

1030-5

The Effect of Lesion Length on the Functional Significance of Coronary Lesions

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Background: Fractional flow reserve (FFR) has become the gold standard in physiologic assessment of coronary artery stenosis. This especially holds true for the functional evaluation of angiographically intermediate lesions. A FFR value <0.75 is considered a reliable physiologic parameter indicating a functionally significant lesion. However, the effect of lesion length (LL) on FFR has not been adequately assessed. The current study was designed to study the effect of LL on FFR in patients with coronary artery disease.

Methods: We performed FFR measurements by pressure guidewire, in 54 lesions (48 pts.). LL and percent diameter stenosis (%DS) at the lesion site were determined by performing quantitative coronary angiography (QCA) analysis.

Results: Overall, there was a moderate inverse correlation between FFR and %DS (r=-0.55, $p<0.001$). Using a receiver operating characteristic (ROC) curve analysis, a LL=10 mm was identified to be the best cutoff value for predicting a FFR<0.75, as compared to LL<10mm (r=-0.75, $p<0.001$; r=0.25, $p=NS$; respectively; Fig). Similar improvement with LL was observed for angiographically intermediate lesions (%DS: 50-70%; r=-0.73, $p=10mm$; r=0.28, $p=NS$ for LL<10mm).